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Effect of claw disorders on milk production, fertility, and longevity, and their economic impact in Spanish Holstein cows

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ABSTRACT

The aims of this study were (1) to estimate the phenotypic association between different degrees of severity of claw disorders and production, fertility performance, and longevity in Spanish dairy cattle, and (2) to quantify its economic impact at the animal and herd level. In this study, claw data comprised 108,468 trimmings collected between 2012 and 2014 by 25 trimmers from 804 Holstein dairy herds. The claw disorders considered were the 3 most frequent disorders in Spanish dairy herds: dermatitis (DE), sole ulcer (SU), and white line disease (WL). The presence of SU or WL was associated with a significant decrease in milk production and was more important in cows in second or later lactations. A severe lesion of SU or WL lead to twice the milk losses associated with a mild lesion, ranging from 1.47 to 2.66 kg/d of energy-corrected milk. The presence of SU or WL during the early lactation period was associated with more days open, fewer inseminations to get pregnant, and longer calving to first service interval (4.83 and 8.0 d longer due to mild and severe lesions of SU, respectively, and 4.94 and 17.43 d longer due to mild and severe lesions of WL, respectively). The occurrence of a case of SU or WL in first lactation had a significant effect on longevity, with severe lesions reducing up to 71 d of productive life. The cost of a mild lesion ranged from $53 to $232 per affected cow and year, whereas the cost of a severe lesion ranged from $402 to $622 per affected cow and year. The annual costs per cow for DE, SU, and WL were $10.80, $50.9, and $43.2, respectively. An average herd with 64 cows had an extra expenditure of $691/yr due to DE, $3,256/yr due to SU, and $2,765/year due to WL. Milk losses, longer calving intervals, and premature culling contributed to more than half of the costs. Therefore, providing this information to farmers could help decide on strategies to reduce the incidence of claw disorders on the farm.

Key words: claw disorder, cost, loss, performance

INTRODUCTION

Lameness is one of the major production diseases in intensive dairy production farming. Intensive selection for high milk production has led to an increase in milk yield in the past few decades but has also increased the incidence of claw disorders and resulted in declining longevity in modern dairy cows (Oltenacu and Algers, 2005). Simultaneously, in response to the demand for high productivity, modern and intensive husbandry with freestall open barns was implemented, which has led to a higher risk of claw disorders (Bell et al., 2009). One-third of the cows present in Spanish Holstein dairy herds have been shown to experience at least one claw disorder per year (Charfeddine and Pérez-Cabal, 2014a). In other countries, such as the United Kingdom, estimates of prevalence ranged from 21% (Clarkson et al., 1996) to 36% (Leach et al., 2010); in the Netherlands, more than 70% of Dutch cows have at least one claw disorder (Somers et al., 2003; van der Waaij et al., 2005).

Claw disorders are responsible for 92% of lameness (Murray et al., 1996), and lameness has been associated with a decreased productivity (Amory et al., 2008), reduced fertility rates (Hernandez et al., 2001), and an increased risk of premature culling (Booth et al., 2004). Different types of claw disorders can be classified as infectious (e.g., interdigital dermatitis and digital dermatitis) and noninfectious (e.g., sole ulcer and white line disease), and each claw disorder has a specific effect on cow performance. Many authors have reported that cows affected by claw disorders have reduced milk production compared with unaffected cows for several weeks, or even months, before and after diagnosis (e.g., Warnick et al., 2001; Green et al., 2002, 2010). Huxley (2013) summarized that a lame cow may produce between 270 and 574 kg less milk per lactation and highlighted the difficulty in comparing the wide range

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of values given in the literature, due to the different ways of describing lameness and the methodologies used for analysis. Rajala-Schultz et al. (1999) estimated the milk loss to be 1.5 to 2.8 kg/d, which means that the total loss per lactation was 310.5 kg. Amory et al. (2008) analyzed the association of specific lesions and milk production on 30 dairy cow farms in England and Wales. They estimated milk loss attributed to SU and WL of 1.5 and 0.8 kg/d, respectively, resulting in total losses over lactation of 574 and 369 kg, respectively. However, for digital dermatitis, the differences between affected and unaffected cows were not significant. Hernandez et al. (2002) found that interdigital phlegmon was associated with a 10% decrease in 305-d mature-equivalent milk yield. Claw disorders also have adverse effects on fertility in dairy cows (e.g., Hultgren et al., 2004). A lame cow has longer calving-to-first-service and calving-to-conception intervals (Collick et al., 1989; Barkema et al., 1994; Hernandez et al., 2001) and needs more inseminations to get pregnant (Collick et al., 1989; Buch et al., 2011). Melendez et al. (2003) reported that cows with claw problems showed lower first-service conception rate (17.5 vs. 42.6% in control cows) and higher incidence of ovarian cysts. Consequently, animals with claw health problems are more likely to be culled (Booth et al., 2004). Onyiro et al. (2008) reported a negative correlation between EBV for digital dermatitis and longevity (as length of productive life). However, the magnitude of the effect of claw disorders on longevity is not as widely reported as effects on production and fertility, perhaps because only severe cases are susceptible to immediate culling, when the mobility of the cow is seriously compromised.

Knowing the degree of severity of lameness is also essential to define performance losses. In the literature, different degrees of lameness led to different effects on production and fertility, albeit not always significant (Hernandez, 2005; Olechnowicz and Jaśkowski, 2015), probably because these studies were carried out on a limited number of cows. However, Bicalho et al. (2007), with around 2,000 cows, found that the interval from calving to conception and the hazard ratio of culling increased as the severity of lameness increased.

The economic impact of claw disorders has been reported in several papers (Kossaibati and Esslemont, 1997; Booth et al., 2004; Cha et al., 2010), where the estimation of losses was done both at the cow level and at the herd level. The costs due to claw disorders were estimated using different methodologies, such as partial budgeting (Willshire and Bell, 2009) and dynamic optimization programming (Cha et al., 2010). Claw health costs are often split into direct and indirect costs. Direct costs are easy to quantify and include treatment, the veterinarian or trimmer visit and time charge, the cost of extra farmer time, and the cost of discarded milk. Indirect costs include mainly the reduction of milk yield, the premature culling, and the extension of the calving interval. Willshire and Bell (2009) estimated overall costs of $100.5, $689.91, and $399.06 per case in the United Kingdom for digital dermatitis, sole ulcer, and white line disease, respectively. Few studies, however, have assessed the economic impact of each disorder differentiating between mild and severe lesion. The degree of severity depends mainly on when the farmer detects the lesion of the affected cow and when it is treated. Therefore, the incidence rate, the degree of severity, the relapse rates, and the duration of each claw disorder may determine the total economic loss. The farmer must then be aware of the cost of each disorder and the consequences of detecting a mild or a severe lesion. This would demonstrate the benefits of implementing good practices, such as detecting lesions and applying treatments earlier and, consequently, improving claw health in the herd. For this purpose, it is important to have a good estimate of the indirect costs associated with losses in milk production, fertility, and longevity, and of the direct costs of each claw disorder and for each degree of severity.

Hence, the aims of the present study were (1) to estimate the impact of claw disorders on milk production, longevity, and reproductive performance, and (2) to quantify the costs of claw disorders in Spanish Holstein cows.

MATERIALS AND METHODS

Claw Health Data

Claw trimming information was obtained from the full claw health database of the I-SAP program (Information of claw health for lameness control and prevention; Charfeddine and Pérez-Cabal, 2014a). The data used in this study included 108,468 records corresponding to more than 48,895 lactations collected between 2012 and 2014 in 804 Holstein dairy herds by 25 trimmers. The I-SAP program was implemented by the Spanish Holstein Association (**CONAFE**, Valdemoro, Spain) in 2012 and collects data (the program is ongoing) for 6 claw disorders: interdigital and digital dermatitis (**DE**), sole ulcer (**SU**), white line disease (**WL**), interdigital hyperplasia, interdigital phlegmon, and chronic laminitis. The collection of health data is an easy procedure. Briefly, CONAFE provides each trimmer involved in the I-SAP program with a touch-screen PC tablet with DATPAT software (developed by CONAFE) for recordkeeping on farms. The trimmers scheduled their visits so that they visited every farm once or twice a year to trim all cows but they could